



Fighting Fires with High-Tech Mist

Fine water mist fire suppression system offers superior protection for high-value installations



Example of Fine Water Mist spray generated by the ADA Technologies extinguishers, shown here during a droplet size measurement experiment. Photo courtesy of ADA Technologies, Inc.

Demonstration of the Fine Water Mist extinguisher on a burning cloth at the Colorado School of Mines (CSM). Photo by Thomas Cooper (lightboximages.com) for CSM.

NASA's Glenn Research Center collaborated with ADA Technologies, Inc. through multiple, related Small Business Innovation Research (SBIR) contracts to develop a novel fire suppression technology for use in both space and ground applications. The Fine Water Mist Portable Fire Extinguisher works like a standard fire extinguisher, but leverages the unique thermal properties of micro-atomized water droplets and is designed to operate in any orientation. Successful on a wide range of fires, this fire extinguishing technology can be used with great effectiveness on a variety of materials, including electronics, composite materials, and lithium-ion batteries. Intended for use onboard the International Space Station (ISS) and next-generation, astronaut-occupied spacecraft, this unique technology is also ideal for use in commercial aircraft and in other enclosed spaces such as mines, clean rooms, hospital labs, and historic buildings.

Benefits of Technology Transfer

- **Environmentally safe:** Because the system uses only water and nitrogen, the technology does not pose a health or environmental hazard. For highly flammable materials, fire extinguishers typically use less desirable agents such as halons and carbon dioxide (CO₂).
- **Cost effective:** The system is affordable, lightweight, renewable, and locally rechargeable.
- **High performance:** The fine water mist droplets (mean diameter 30µm) offer high surface area for exceptional heat absorption and high spray momentum to achieve optimal performance in both open and cluttered areas. The patent-pending effervescent atomizing nozzle assembly enables uniform discharge, regardless of system orientation.

On the Record

“The technology not only benefits NASA’s human space missions but also has potential in many Earth-based applications in diverse areas such as commercial aerospace, military aviation and marine vehicles, tunnels and mine shelters, and historic buildings and museums.” —*Dr. Suleyman Gokoglu, Project Lead, Combustion and Reacting Systems Branch, NASA’s Glenn Research Center*

“New and disruptive technologies in fire suppression are notoriously difficult to develop and commercialize due to the criticality of emergency devices such as fire extinguishers and the associated need for extensive testing and validation. The continued support of NASA over the years has enabled ADA to invent and refine an elegant and effective solution with many business opportunities.” —*Dr. Thierry Carriere, Director of Technology, ADA Technologies*

About ADA Technologies, Inc.

ADA Technologies, Inc., headquartered in Littleton, CO, was established in 1985 and specializes in nurturing innovative technologies to commercial success. ADA Technologies has been collaborating with Glenn on the fire suppressant technology since 2006.

Technology Origins

NASA needed a lightweight, rechargeable fire suppression system for the ISS and next-generation manned spacecraft. Fire extinguishers used to manage fires on space vehicles and aircraft currently use CO₂ and halons as fire suppressants. These agents are being phased out, and the Fine Water Mist system offers an ideal replacement technology.

NASA originally worked with Colorado School of Mines on the fundamentals of water mist technology. The basic research resulted in the space-flight experiment Mist and flew on Space Shuttle Columbia (STS-107). This project transitioned and became more hardware- and product-driven, eventually leading to the SBIR grants for the extinguisher design. The collaborative research between Glenn and ADA Technologies produced this novel extinguisher that can be used in microgravity, recharged in space, and works on a variety of fires. These attributes make the technology well suited for use on spacecraft, where there is a confined area, limited water supply, low weight requirements, sensitive equipment, and restrictions on chemical use.

The Transfer Process

With funding from NASA’s SBIR program, ADA Technologies developed and validated several prototype fire extinguishers for use in microgravity conditions. The prototypes were tested and performed satisfactorily in a variety of fire scenarios designed to represent worst-case situations aboard a manned spacecraft. These tests included electrical fires and flammable material

fires, in open cabin and instrument rack scenarios. The prototypes successfully extinguished test fires in an atmosphere containing 34 percent oxygen by mole and 8 psia total pressure, representing a more challenging spacecraft environment for fire suppression than regular 21 percent oxygen and 14.7 psia.

Gearing Up for Commercialization

ADA Technologies is adapting this space technology for use in commercial aviation, commercial space transportation, and high-value content buildings. Commercialization efforts currently underway include the following:

- The fire suppressant system is being finalized for ISS deployment in 2014.
- A prototype commercial handheld Fine Water Mist extinguisher, based on the ISS design, has been built for hospitals and mine operators. Underwriters Laboratory certification and broad commercialization is planned for 2013-2014.
- The company received funding to adapt the fire suppression technology for use in US Air Force Aviation Engine Test Facilities in 2010.
- The Department of Defense is interested in the technology for protection of light armored vehicles and rotorcraft.
- ADA Technologies received additional funding from NASA SBIR and the Federal Aviation Administration to commercialize the prototype for the aviation industry as a viable replacement for portable Halon 1211 extinguishers. Given the increased use of lithium-ion batteries in aircraft Auxiliary Power Units and consumer electronics, the high cooling capacity Fine Water Mist extinguisher will be more effective than conventional extinguishers.

For More Information

For more information about this technology, please contact:

Innovation Projects Office
NASA’s Glenn Research Center
Phone: (216) 433-3484
E-mail: TTP@grc.nasa.gov
<http://technology.grc.nasa.gov>